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A

METHOD

OF PRODUCING

DOUBLE FLOWERS

FROM

SINGLE,

BY A

Regular Courſe of CULTURE.

Hill (Sir J.)

K.

Illuſtrated with FIGURES.

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BRITISH MUSEUM

DEDICATION.

To the Celebrated

Dr. HALLER.

SIR,

IT is not that I ſuppoſe my weak voice can return the honour you have been pleaſed to do me, by the mention you have made, in your immortal works, of ſome of my attempts towards the advancement of botanical knowledge: that were a thought as vain, as it were idle: but where returns are impoſſible, there may yet be gratitude. I addreſs my acknowledgements to you in this ſlight Treatiſe:

wherein, whatever may be wanting, there yet is TRUTH: and ſome of it has not been known before.

THE World will pay a due regard to theſe doctrines, when they ſee I dare addreſs them to your experienced and diſcerning eye: and I have ſome pride in dedicating the reſearch to the eternal memory of thoſe new lights which your genius and indefatigable labours have thrown, not on this ſcience only, but on all philoſophy.

I am,

With the moſt perfect Reſpect,

SIR,

Your obedient

and humble Servant.

London,
Jan. 4, 1759.

J. HILL.

THE PRODUCTION OF DOUBLE FLOWERS.

THE raiſing double flowers is one of the great articles in the gardener's and floriſt's profeſſions. 'Tis often done: but none knows how. The practice by which theſe elegant plants are obtained from the ſingle, is little different from that by which, in other kinds, ſingle riſe from ſingle in ſucceſſion; and the procedure is merely mechanical: the gardener practiſes in his age, what he ſaw done in his youth; and he expects the ſame ſucceſs, without farther thought.

It would be happy if the change thus produced in a few plants could be extended to many: and perhaps this is not beyond the human reach. To attain the end, it muſt be attempted regularly; and in order to that, the ſubject muſt be firſt underſtood.

We muſt know by what means and in what manner nature gives this doubleneſs to flowers, in the inſtances already ſeen, before we can attempt rationally to aſſiſt in her operations upon others: but when that is diſcovered, the juſt grounds of ſuch an undertaking will be known.

The ſtalk of every plant is compoſed (as has been clearly ſhewn) of ſix diſtinct ſubſtances; ſurrounding one another in a regular manner: theſe are the outer bark, the inner rind, the blea, a vaſcular ſeries, the fleſhy ſubſtance, and the pith. The roots are compoſed of theſe; they are continued thence up the ſtalk; and from one or other of them are formed the ſeveral parts of flowers.

THERE is no way to underſtand what the doubleneſs of a flower is, or of what it conſiſts, until this ſtructure of the whole plant be underſtood.

As all the parts of a flower are continuations of one or other of theſe ſubſtances, all doubleneſs in flowers muſt be owing to the luxuriance of ſome of them: nothing new is produced, nor can be; only ſome original part is extended.

THE firſt ſtep towards underſtanding the proceſs of nature, is to examine which of the proper parts of a flower has afforded the luxuriant growth: We are then to ſee to what original portion of the plant, that is to which of the ſix ſubſtances whereof the whole conſiſts, that part belongs: when we know this, we are to enquire by experiments, what nouriſhment, and what method of culture moſt favour the growth of that part: and, if we find this, we ſhall diſcover the great ſecret.

WE ſhall thus know how at our pleaſure to double the flowers of many plants;

and

and to produce that luxuriance in degree as well as kind.

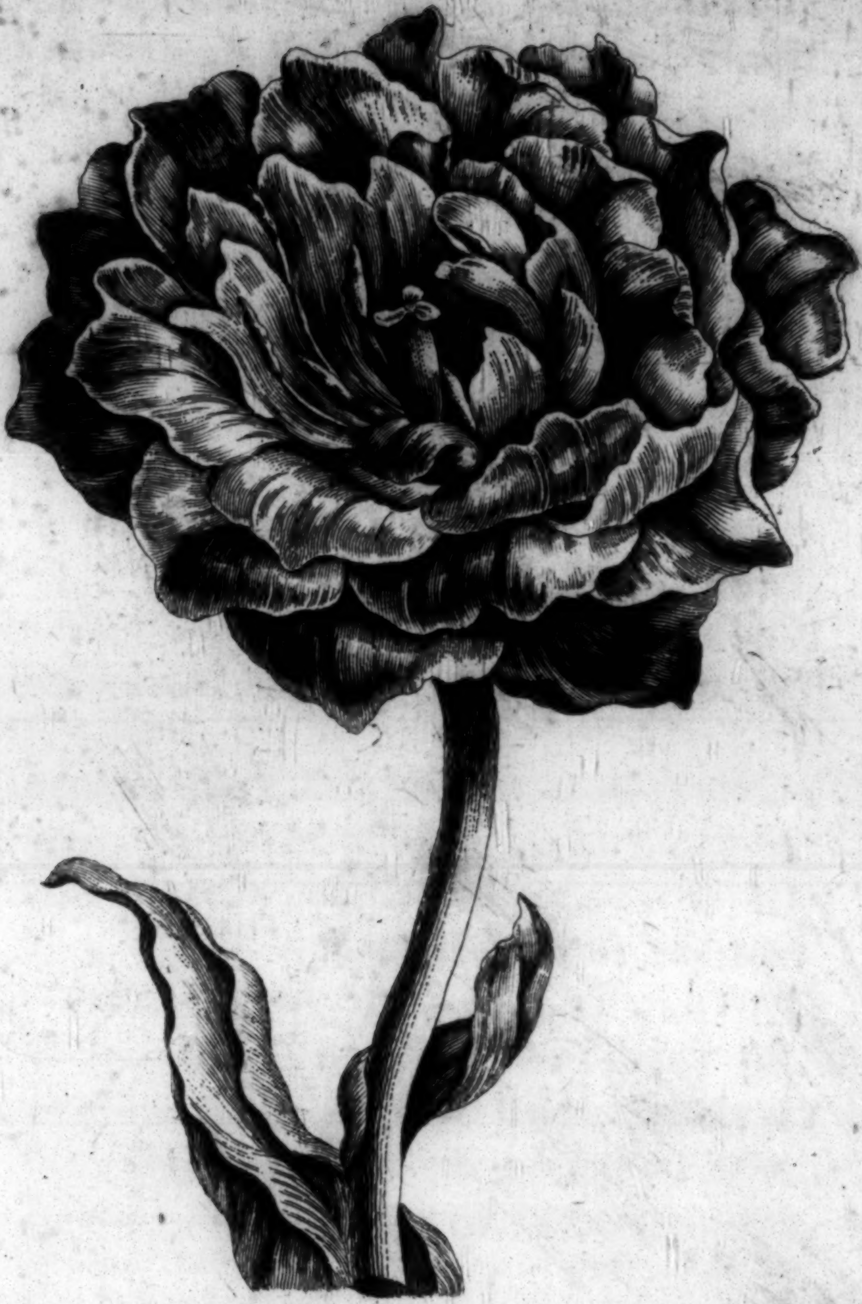
In this courſe it is propoſed to purſue the ſubject in the preſent enquiry: determining the firſt attempt to a ſingle plant. There is no other way to avoid perplexity; and if we ſuccede in this, it will be eaſy to continue the ſame reaſoning, and the ſame practice to others.

It will be moſt uſeful to ſelect a plant, in which the parts are large and plain; and one, of which we can be ſure, during the ſucceſſive years of trial. I ſhall for theſe reaſons chuſe a Tulip. The organs in this flower are all large, the doubleneſs is not too complex, and the root being yearly taken up, we can always be ſure of having the ſame plant.

The Tulip is not ſelected as an inſtance for its beauty; for it is leſs improved by doubleneſs than many other flowers: but becauſe the parts being few, large and diſtinct, the courſe of nature may be traced in it eaſily.

4 OC 58

Pl.O.



THE IRREGULAR FULL TULIP.

I. Hill delin et Sculp.

Gardeners deſpiſe double Tulips; and if no better could be produced by art than ſuch as offer themſelves to them by accident, they wou'd have reaſon. They ſee the Clerimont with a ragged multiplicity of ill ſhaped petals; or the common breeder reduced to a dwarf and edg'd with white, with a wild cluſter of like petals, and the filaments irregularly diſpoſed among them; or with half formed petals growing from the edge of ſome of the filaments, and buttons upon the irregular extremities of others. This is all they ſee of doubleneſs in Tulips; and this riſes wildly. *See* Plate (o)

But if doubleneſs in a Tulip can be produced in a regular manner, the new leaves rendered as well ſhap'd as the old, and the ſame excellence of colour preſerved in theſe, as in the ſingle, doubtleſs the floriſt will receive it into his liſt of beauties. That this may be done appears very probable; and the inſtances here produced ſhew there will be great beauty in the flowers: not only in their perfect ſtate of doubleneſs, but in the ſeveral advances towards it. The attempting this regularly, is a work of time, becauſe the

Tulip is a ſlow grower from ſeed; but by the flowers here produced there is reaſon to believe it will ſucceed: and the benefit will not end there. Nature proceeds nearly alike in her ſeveral operations, and what proſpers in one plant probably will not fail in another.

The origin of the Tulip flower is this. The fleſhy ſubſtance of the ſtalk terminating in the antheræ, there forms a minute plant, or rudiment of a plant in each grain of the farina: this is received into the ſtigma; and thence conveyed by a ſhort courſe to the ſeed veſſel; where it is lodg'd in the yet empty hull of a ſeed *: it is there cloathed with a farinaceous ſubſtance, ſecreted for that uſe in thoſe veſſels; and, the ſeed hardening, it is perfect.

This ſeed being ſown, the rudiment of the plant expands by means of the heat and moiſture; and its ſeveral parts growing, downwards into fibres, and upwards into a ſtalk and leaves, the Tulip is produced, which in its perfect ſtate we are now to examine. See plate 1.

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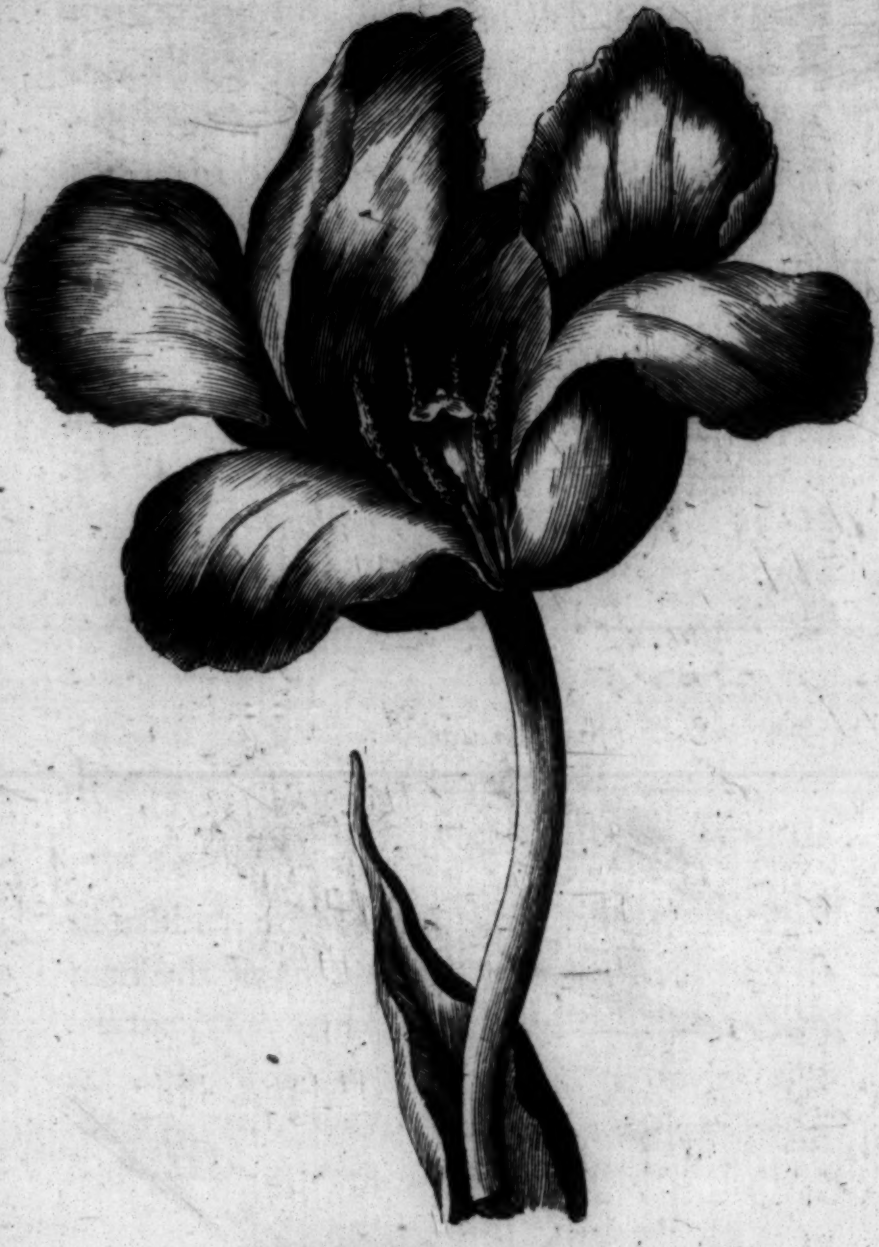
* This is explained at large in *Outlines of vegetable generation.*

Pl. 1.



COMMON TULIP.

J. Hill delin et Sculp.

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As the rudiment in the farina is very tender, it takes a long time in expanding all its minute parts, and growing to perfection: and to defend the more delicate organs of the flower the bulb is formed. This is not the root, tho' it be vulgarly ſo called, but is a germ or bud, ſurrounded by a number of coats, and films like thoſe which cover the young leaves in buds of trees.

THESE films are produced or thrown off from the outer bark of the fibres; which are the real proper and only roots: and from the innermoſt of theſe films proceed the leaves.

THE regular continuation of the four other ſubſtances is in the ſtalk and flowers: and it is performed by nature in this manner.

THE outer bark which is thin and delicate, is defended and kept moiſt towards the baſe of the plant by the lower ends of the leaves, which ſurround the ſtalk: but higher up, where it is naked, it becomes harder and ſomewhat thicker.

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IT runs up to the ſummit of the ſtalk, and there forming three thick knots or cluſters, is continued through them into the three outer petals of the flower. Theſe are formed entirely of it, and in theſe its whole ſubſtance terminates.

IN plants which have a cup under the flower, the outer bark of the ſtalk forms that cup, and terminates in it: the ſecond, or inner rind forming the petals, by a continuation into the flower.

IT has not been enough regarded; but nature where ſhe gives no cup to the flower, always allows ſomething analogous. The Tulip conſiſts of ſix petals: of theſe the three outer are harder than the three inner, and ſerve as a defence to them. They are a kind of cup to the three delicate ones within.

THE outer bark of the ſtalk conſtitutes theſe three petals entirely; and it is there loſt. When the flower is newly opened, it has the property of the leaves of ſleeping plants; ſhutting itſelf together in the dark,

dark, whether it be night or an artificial gloom; and opening again in the light.

The cluſter of fibres at the baſe of each outer petal perform this: They are the hinges on which the motion is made; and the delicate inner petals are forced together by them. The fibres which form theſe cluſters are white; and are as ſtrong as raw ſilk.

Various accidents influence the increaſe or diminution of particular parts in the compoſition of plants, but with this outer bark we have nothing to do in the preſent reſearch: The doubleneſs of the Tulip is what we enquire into, and that ariſes only from the fleſhy ſubſtance of the ſtalk. The outer bark terminating in the three exterior petals, we are now clear of it.

In diſſecting the Tulip ſtalk tranſverſely and along, the next ſubſtance ſeen under this is the *inner rind.* This is greeniſh, but tending to white in the inner ſurface: It continues its uninterrupted courſe to the flower, and there forms the three inner petals.

petals. Theſe have their origin plainly from this interior rind; and the fibres may be traced down from their baſes to the ſtalk, with great eaſe.

This coat of the plant terminates plainly and ſolely in theſe; and conſiſting of ſimple and not numerous parts, it is incapable of any increaſe, or diviſion, in the flower.

The courſe of examination ſhould be to remove the ſeveral parts thus ſeparated, as ſoon as we have thoroughly examined them: therefore the two rinds of the plant and the two ſeries of petals being now cleared away, there appears as the outer ſubſtance the *vaſcular courſe*, or third portion of the ſubſtance of the plant. This is extremely delicate and ſmall in the Tulip. In a tranſverſe ſection of the ſtalk it appears only as a line ſeparating the greeniſh inner rind from the white fleſhy ſubſtance of the ſtem; and in a longitudinal ſection it reſembles a mere membrane.

The microſcope ſhews that it conſiſts only of a ſingle row of veſſels: it terminates

minates juſt within the baſes of the inner petals; and there forms an irregular line nearly hexagonal, with ſmall riſings between the baſes of the petals.

In many plants this part riſes up conſpicuouſly in the flower; forming what is called a nectarium. The large nectaria in the Hellebore are formed of it; and that tufted ſubſtance in the Amaryllis, examined in a preceding work *. Whether the termination of this part riſes above the ſurface of the flower, or lies within its compaſs, and hid under the ſkin of the baſes of the petals, its ſtructure at the termination is the ſame. The veſſels ſwell and are clos'd at their extremities; and they communicate with no part but the baſes of the filaments. This is plainly and evidently the caſe in the preſent inſtance; and therefore probably in all plants this vaſcular courſe ſerves the ſame purpoſe; ſecreting a waxey humour, and giving it to the veſſels of the filaments, for defending the embryo plants in the farina.

All theſe parts being cleared away we come to the fourth in order, which is the fleſhy

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* Outlines of vegetable generation.

fleſhy Subſtance of the ſtalk. This we may trace with eaſe up to the filaments themſelves, which are formed abſolutely and ſolely of it: and from obſerving its ſtructure we ſhall find the reaſon why Tulips are doubled, in the manner to be repreſented in the ſucceeding plates, more eaſily than many other flowers.

DOUBLENESS in various flowers riſes from a luxuriance of different parts: In Columbines from what are called the nectaria; which are either ſimply increaſed in number, or converted as it were into petals; and in the Narciſſus kind, ſometimes by an increaſe and diviſion of the nectarium, the petals remaining as they are naturally, ſix in number; and ſometimes by an abſolute increaſe in the number of the petals: But in the Tulip it is altogether otherwiſe; the doubleneſs of this flower ariſes from the filaments and no other part; and is accompliſhed in the ſucceeding gradations.

WE ſee by the diſſection of the plant, that the filaments are formed of the fleſhy ſubſtance of the ſtalk, or more properly ſpeaking, they are the termination of that part. During its courſe up the ſtalk it has been defended by the ſurrounding ſubſtances; but in the filaments which are expoſed to the air the membranes inveſting it become more firm, and its ſubſtance more compact: that is all the difference.

This fleſhy ſubſtance is remarkably thick in the ſtalk of the Tulip. Its quantity is greater than in any other plant I have examined: and hence ariſes the natural tendency of the Tulip to doubleneſs; from a luxuriance of the filaments.

These are in the ſtate of nature very thick in this flower, and of a peculiar ſhape and conſtitution: they are flatted, tho' irregularly, and are edged and triangulated; and they are uſually coloured. In all this they reſemble petals more than the filaments of the generality of flowers; which are uſually rounded and ſolid.

These in the Tulip ſhew a very peculiar conſtruction when cut open, and ex-

examined by the microſcope. They are found to conſiſt of two parts, a ſolid central yellowiſh matter, and a coat or ſhell of a filmy ſubſtance ſurrounding it. This is looſely and eaſily ſeparated from it.

THE thickneſs of the filaments ariſes from that of the fleſhy ſubſtance of the ſtalk, whereof they are ſo many continuations: and it renders them liable to alter their form by farther ſwelling, if an increaſe of that part favours ſuch change: their peculiar ſtructure alſo makes it eaſy for them to ſpread into a reſemblance of petals, the membranes covering them being much of that nature.

THUS the doubleneſs of the Tulip is produced only by a luxuriant growth of its filaments; which in that ſtate loſe their proper nature, and become a kind of petals. This flower is moſt liable to ſuch doubleneſs, becauſe the fleſhy part of the ſtalk is thick; and plainly the doubleneſs is owing to an increaſe in the quantity of that part. The practical leſſon follows hence plainly. Certain circumſtances in the culture and management of plants favour the increaſe of particular parts in their conſtruction: the way therefore to produce double Tulips, and to increaſe the degree of their doubleneſs, is to diſcover what circumſtance, what ſoil, manner or management it is that thickens this fleſhy part in ſome degree: and to apply it early, and purſue it thoroughly. What may be done in this caſe we ſhall ſhew by declaring what has been.

As we have on this occaſion named the four exterior coats of the Tulip-ſtalk, it may be proper to ſay what becomes of the pith, or innermoſt ſubſtance. This is continued to the rudiment of the ſeed-veſſel, and terminates in it. That rudiment with its ſtigma, for there is no ſtyle, are formed of it entirely.

CHAP. II.

Of the Progreſs of the Doubleneſs in the TULIP.

THE TULIP in its natural ſtate, conſiſts of ſix petals, ſix filaments, and a rudiment of a ſeed veſſel, crowned with a ſtigma, divided into three parts. See *fig.* 1.

THE three principal organs of flowers are ſeen in it very diſtinct and plain, with no additional part, (as in the caſe of thoſe that have conſpicuous nectaria) nor any interruption, as in double flowers.

WHEN the Tulip alters from this plain and natural ſtate, becoming double, the courſe and progreſs of nature may be trac'd in it, in five ſtages; and theſe naturally ariſe in ſucceſſion one after another; the doubleneſs increaſing each year from the firſt.

BUT this, though natural, and uſual, is not an invariable courſe: ſometimes a Tulip from being ſingle, burſts at once into full doubleneſs; ſometimes on the contrary when the change has been regularly begun, it comes to a ſtand in the ſucceeding year: and any double Tulip being left neglected in the ground, will again become ſingle.

WHEN a large quantity of the ſeeds of well choſen ſingle Tulips are ſown, and the plants are raiſed by proper care to flowering, there will ſometimes appear among the number a few double ones the firſt year of bloom: but this is rare; and they are never perfect.

The full change is too great to be expected at once; for it is an old and true maxim, that nature does nothing by leaps, but all in a regular gradation.

Among the number of Tulips thus raiſed, the greater part will be plain and natural; but a nice and well inſtructed eye will ſee in ſome few, the firſt approach to doubleneſs. Theſe are to be ſelected; and they are thus known.

In the natural ſtate, the filaments are raiſed in three blunt ridges, and are thick in proportion to their breadth. In ſome, theſe filaments will have loſt the outer ridge, or that at the back; and the whole filament will be broader, thinner, and flatter than uſual; and will begin to ſhew a different colour, tending to that of the petals. The antheræ alſo are in this caſe ſhorter.

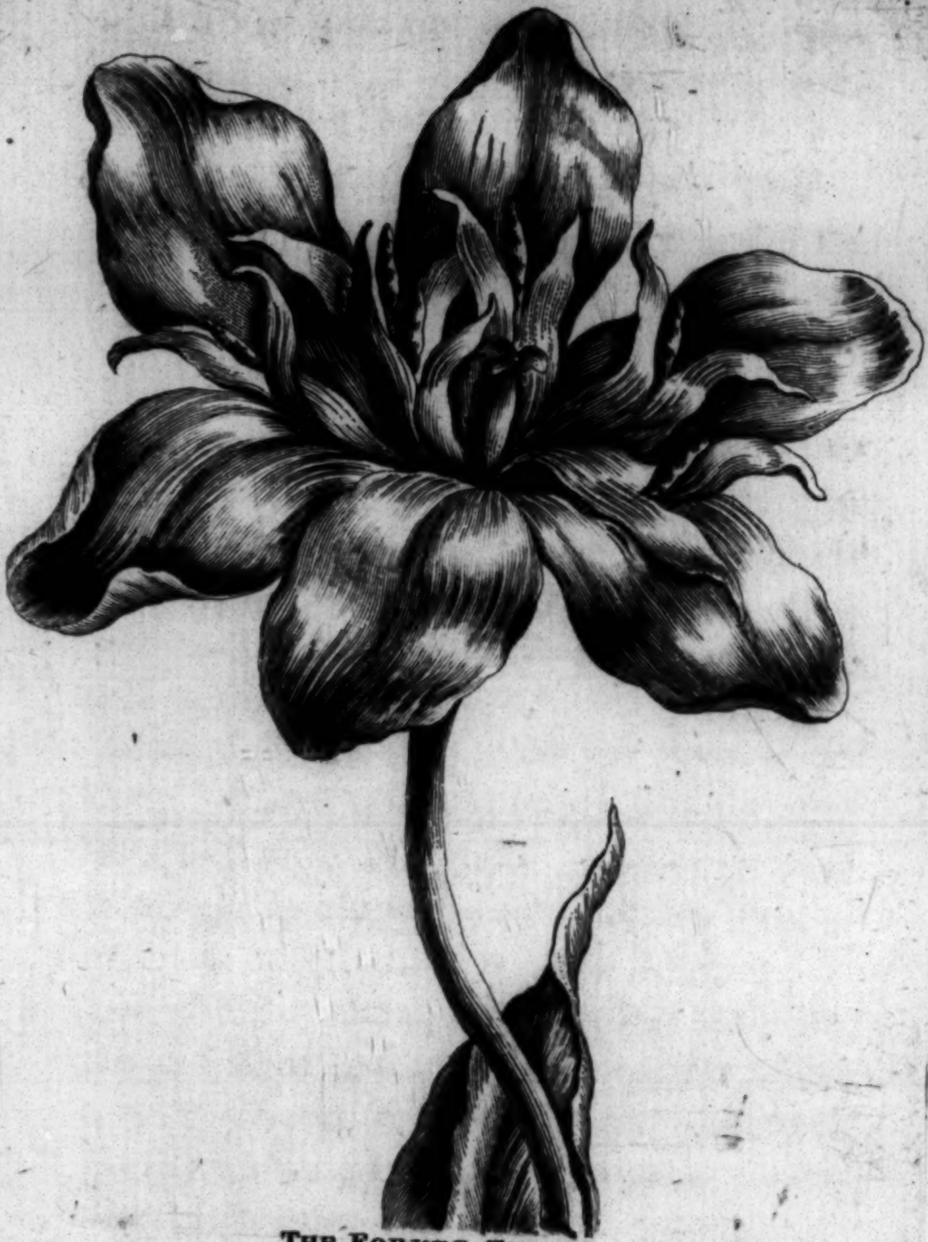
This is the firſt approach which nature makes to doubleneſs. This the floriſt is to mark; and the plants in which it appears are to have peculiar care in the following years.

The ſeveral gradations from this to perfect doubleneſs, are to be expected in the five ſucceeding ſeaſons.

Though the firſt approach towards this ſtate in the Tulip be ſlight, and not diſtinguiſhed, except by the inquiſitive eye; the ſecond is conſiderable, and ſufficiently plain. In this the filaments are ſo altered, that if they did not ſtill ſupport their antheræ, they would not by the common eye be known for ſuch, or called by that name: they are indeed converted into a kind of petals. They are thin like the natural petals; and a quarter of an inch in breadth: their colour alſo as well as ſubſtance is that of the petals. They riſe with a ſingle body, but at half their length they ſplit. In the cleft of this diviſion is ſeated the anthera: and the two parts of the divided filament are continued upwards in a moderate breadth, and in a waved form. *See Pl.* 2.

The

Pl. 2.



THE FORKED TULIP.

J. Hill delin et Sculp.

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The anthera in this ſtate of the flower is ſhorter, and leſs than naturally: but it ſtill ripens a perfect farina. The ſeeds of ſuch a Tulip ſeparate from all others will be perfect; and being ſown, will ſucceed very well. I name this particularly, becauſe they are the fitteſt of all Tulips from which to ſave ſeed for double flowers.

Though the filaments in this ſtate of doubleneſs have changed their form and colour, their conſtruction remains the ſame as at firſt: each is compoſed of two membranes and a pulpy central ſubſtance; but this laſt part is ſmaller in proportion than in the natural Tulip. This ſeems to be the matter which immediately feeds the anthera; and therefore the farina, though leſs in quantity, yet is in this ſtate perfect.

The third degree of doubleneſs in the Tulip extends the filament in breadth yet farther, and ſtarves the anthera entirely: therefore the flower is in this ſtate incapable of ripening ſeeds.

The Tulip now conſiſts of twelve real petals: he who has trac'd the origin and obſerved

ſerved the courſe of the production, knows that the ſix inner ones are formed from filaments; but to another they would appear almoſt perfect as the reſt; only ſhorter and nip'd at the top. Though they have been form'd from filaments, they are now truly petals. We learn by this that nature tho' ſhe regularly forms each part of the flower from a peculiar coat of the plant, in her uſual courſe; yet can make the expanſion of another portion anſwer the ſame purpoſe.

In this ſtate of doubleneſs the original petals of the Tulip ſtand in two ſeries, in their natural order, three external and three interior; the ſix additional petals form one ſeries riſing within both: one in the center of each perfect petal, as the filaments roſe in their natural ſtate. *See Pl.* 3.

Each of theſe additional petals, for in this condition of the flower they are abſolutely ſuch, is nearly of the breadth of the original ones, but not exactly of the ſame form. There is now no deep ſplitting or diviſion into two parts at the top, as in the former condition of doubleneſs, where the anthera held its place in the center of the cleft; but the ſummit of the petals

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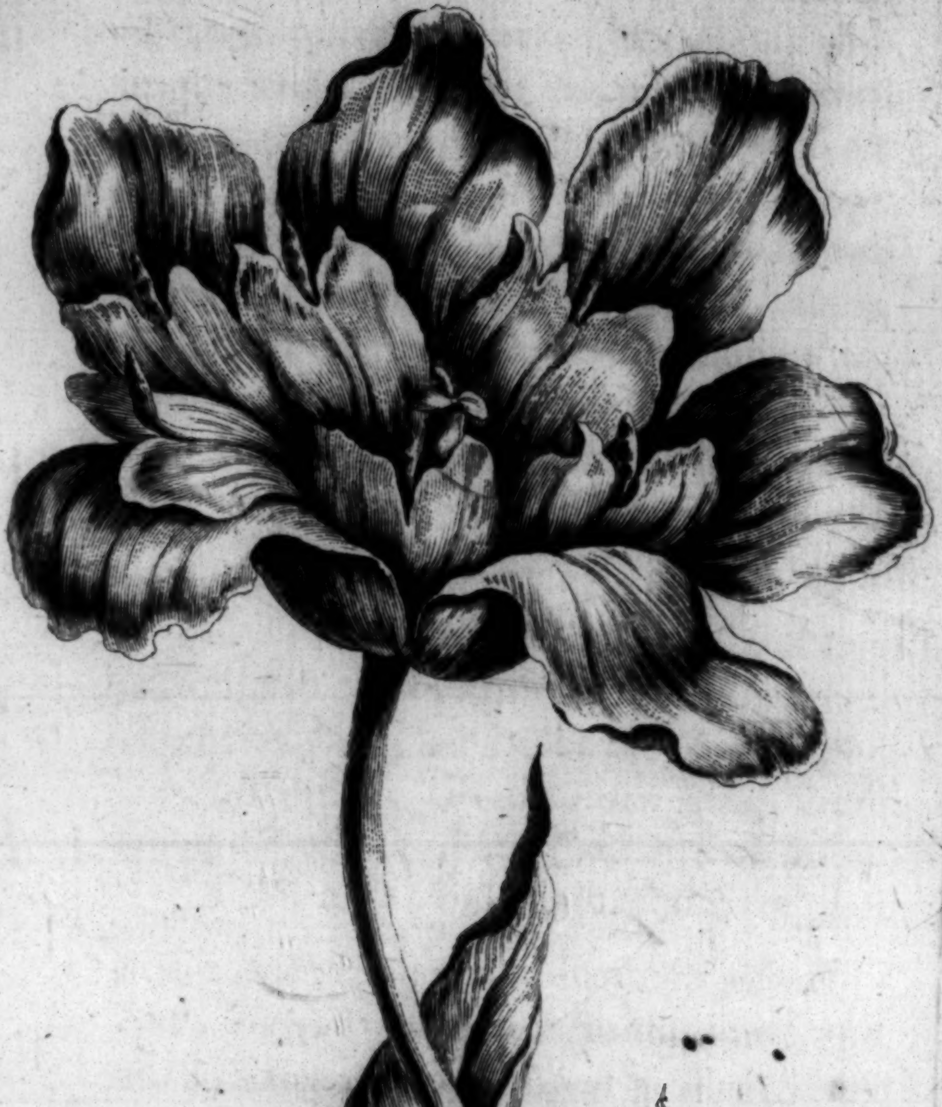
Pl. 3.



THE DOUBLE TULIP

I. Hill delin et Sculp

4 OC 58

is variouſly wav'd, and all that remains of the appearance of an anthera, is a point of a purple colour in the middle hollow of each of theſe petals; formed of what would have been the outer coat of the anthera. And even this is ſometimes obliterated.

The form of theſe additional petals is oblong, with ſufficient breadth to give a regular appearance in the flower. Their upper edge terminates variouſly; ſometimes they are pointed, uſually very obtuſe; in ſome flowers wav'd, and in others cut into deep inciſions.

Their ſubſtance and conſtruction ſtill continue what they were in the filament; and differ, tho' not greatly now, from thoſe of the other petals. Each is compoſed of two membranes, ſeparated by a pulpy matter. This is the double Tulip.

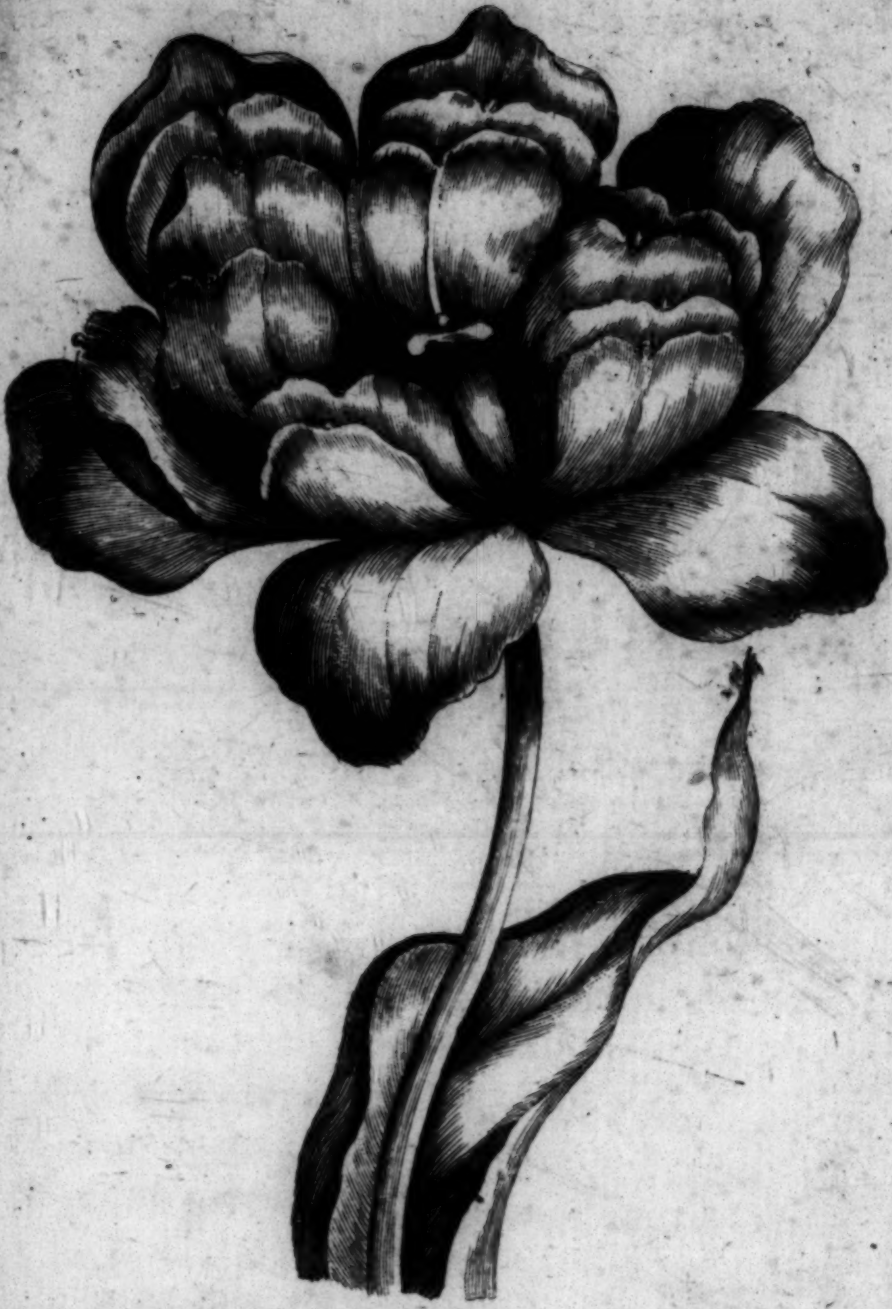
The fourth gradation, or ſecond doubleneſs in the Tulip, renders it ſo unlike its firſt, or natural ſtate, and ſo nearly obliterates all appearance of the parts from which the new petals have been formed, that none, unleſs in this courſe of enquiry could ſay whence it had proceeded.

In this ſtate, or the Triple Tulip, there are four ſeries of petals: the two outermoſt are natural, they conſiſt each of three petals, and are what properly conſtitute the flower. The two other ſeries conſiſt of ſix petals each, and theſe are formed by a luxuriance of the filaments, and an obliteration of the anthera, as in the former inſtances: with the additional peculiarity of their being ſplit. This conſtitutes them twelve in number, and as the inner ſix are formed of the anterior ſides of the filaments; they ſtand naturally forwarder than the others: this diſtinguiſhes the twelve into two ſeries. *See Pl.* 4.

To underſtand the conſtruction of this flower perfectly, one muſt go back to the natural ſtate of the filaments; from an expanſion and luxuriance of which, all this doubleneſs is ſtill formed.

We have ſeen in the original ſtate, they are compoſed of a ſolid central part, ſurrounded by a membranous covering. In the firſt ſtate towards doubleneſs in the Tulip, the filament extends in breadth, and this inner ſubſtance loſes ſomething of its thickneſs; in the ſecond ſtage where the

Pl. 4.



THE TRIPLE TULIP.

I.Hill delin et Sculp.

4 OC 58

the anthera ſtands in the cleft of the extended filament, this inner ſubſtance is ſtill more reduced; in the third ſtage, where the anthera is a thin line, this ſubſtance is only a kind of membrane uniting the two ſides of the new petal; and fourthly, in this ſtate of tripleneſs it is a mere dot. 'Tis the expanſion of the membranous coat of the filaments which makes the new petals: and the inner ſubſtance has no uſe in this change. It before ſupplied the anthera: that was its purpoſe; and while the anthera remained in the ſecond change, this ſubſtance remained alſo, though in leſs than the original quantity. In the ſucceeding ſtate, tho' it remained in ſome ſmall degree, its uſe and office were loſt; and in this triple condition of the flower being wholly gone, the two parts of the expanded filament, have nothing to unite or hold them together.

This third ſubſtance is naturally placed between them, therefore they are not joined to one another by any fibres or veſſels of their own, except at the baſe; and the third ſubſtance which kept them together in the laſt mentioned degree, being now gone, they ſeparate. Each ſide of the expanded filament becomes a new petal; and thus twelve are added to the flower.

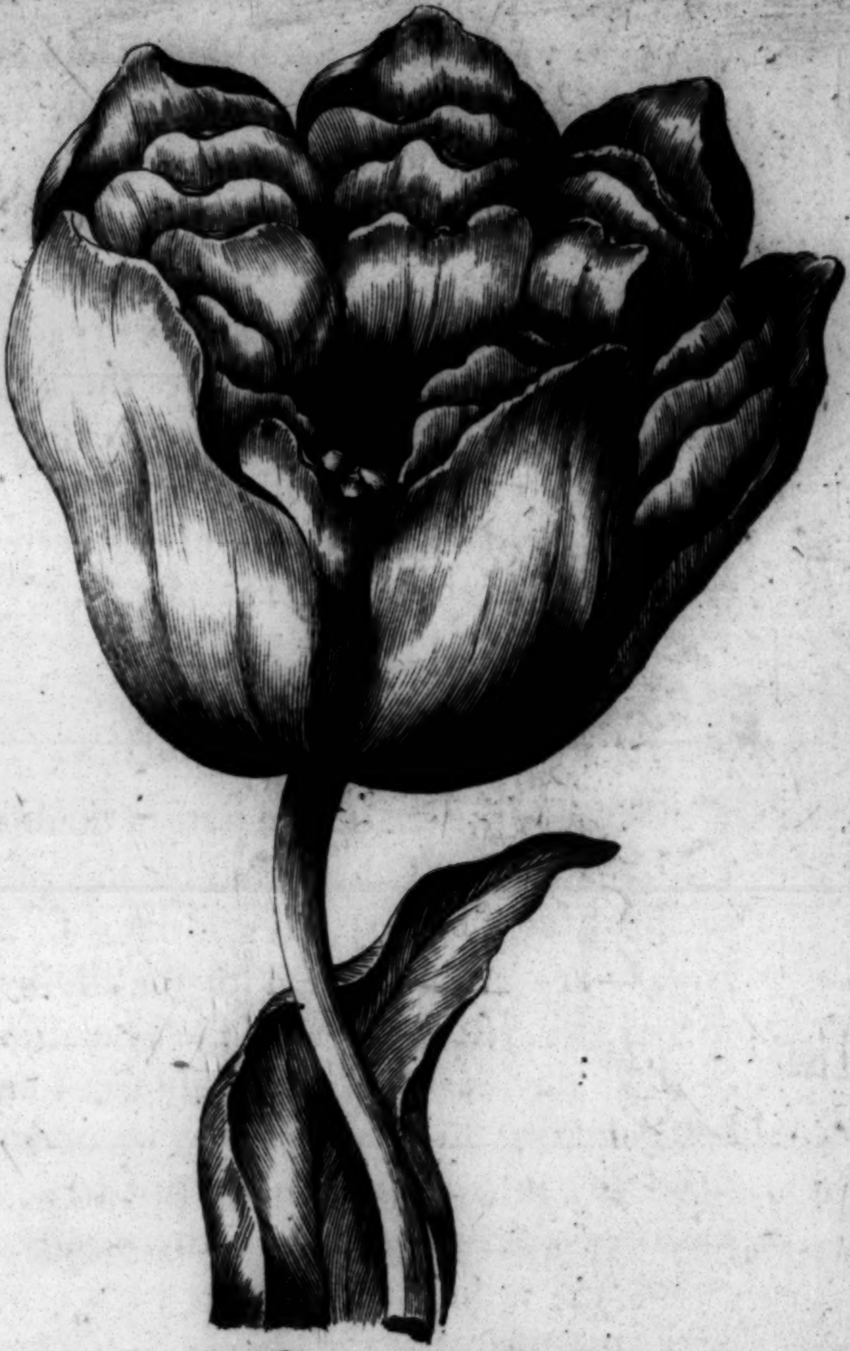
In a ſucceeding year each filament ſplits into three inſtead of two broad petals, and thus forms the QUADRUPLE TULIP; *See Pl.* 5: and one year more makes the PERFECT FULL TULIP. In the quadruple kind there remains a ſmall mark of the anthera on each new petal, but in the perfect double flower there is none. *See Pl.* 6.

CHAP. III.

Of Doubleneſs in the VERONICA.

SUCH is the courſe and ſtate of doubleneſs in the Tulip: and by this progreſſion it will be perfectly underſtood. So large a flower was ſelected for the illuſtration of the ſyſtem, becauſe the gradations in thoſe obvious parts are eaſily ſeen; and being known in this they may be underſtood alſo in many which are ſmaller. It has been obſerved there are other kinds of doubleneſs ariſing from other parts; but with that ſpecies of the change which proceeds from the filaments, the courſe of natur is the ſame in all.

Pl. 5.



THE QUADRUPLE TULIP.

J. Hill delin et Sculp.

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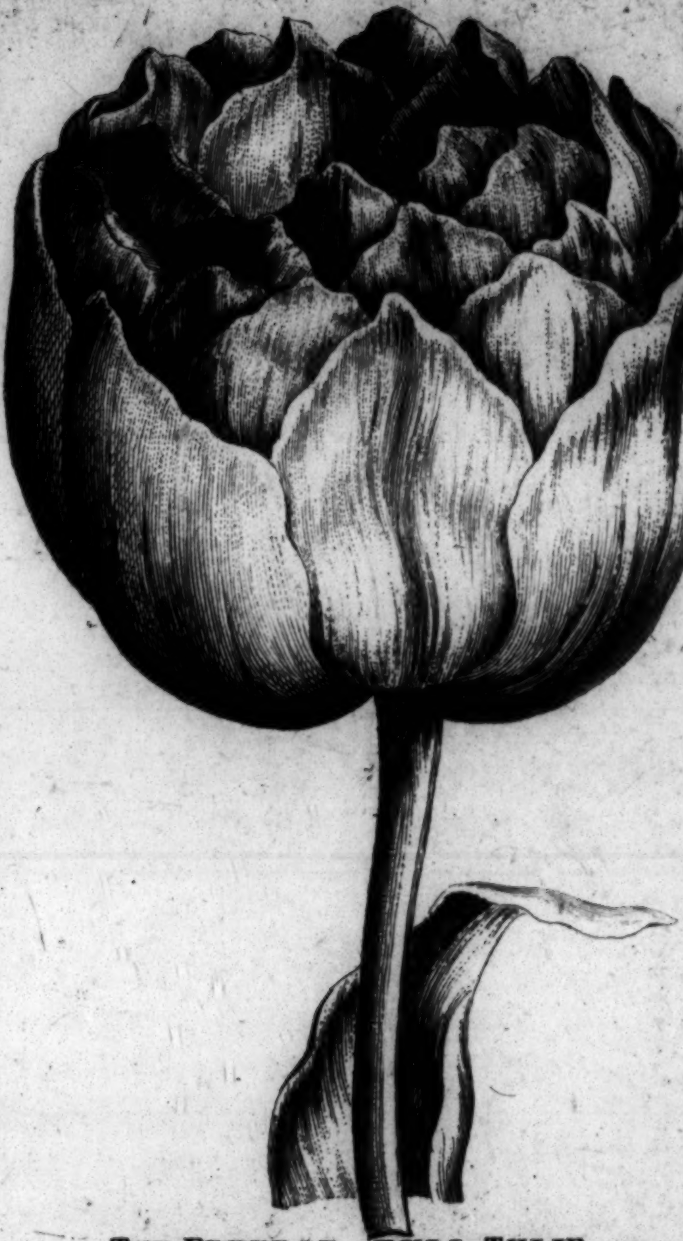
Pl. 6.



THE PERFECT FULL TULIP.

I Hill delin et Sculp.

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THE common tall *Veronica*, or Speedwell of our gardens, has a flower as ſmall as any that is cultivated for ornament: but the great number of them, and their regular diſpoſition in the ſpikes, gives them ſome claim to regard; and the celeſtial blue, which is their proper colour, more.

I DON'T know that it had been obſerved, till I remarked it in *Eden*, that the flowers of this plant ſometimes have a kind of doubleneſs. 'Tis a very eſſential article in their beauty: for it not only adds ſomewhat to their ſize, but continues the fine azure colour perfectly through their whole body.

THE flower of the Veronica is placed in a ſmall green cup. It conſiſts of one petal, tubular at the baſe, and cut into four oval ſegments at the top. Theſe are of a fine blue. Within theſe ſtand two filaments: they are naturally long, and towards the top have ſome breadth: they are of a whitiſh colour, and the antheræ which crown them are alſo white at firſt; but when they are burſt, they are yellow.

These parts are plainly ſeen in ſo ſmall a flower: and as the glow of univerſal blue in the ſpike is the true beauty of the plant, this party coloured inſide of the bloom greatly degrades the whole. In flowers too minute to be ſeen at any diſtance diſtinctly, the general good aſpect of the cluſter is what we are to attempt.

This, when the colour is all blue, gives as it were the appearance of one pyramidal flower to the whole ſpike. It cannot be thus in the natural condition of the plant; but accidents we do not underſtand make it ſo ſometimes in gardens: nor does the common eye even while it admires the effect, ſee the cauſe.

In thoſe plants of the Veronica which have ſpikes perfectly blue, the flowers are in a certain ſtate of doubleneſs. It is the ſame degree in the gradation of the Tulip, in which the filaments are expanded into a kind of petals; and the antheræ are wholly obliterated.

The change is leſs conſpicuous becauſe the flowers are in this plant ſo much ſmaller:

ſmaller: and it is indeed leſs in itſelf, becauſe the flower has only two filaments to be the objects of the variation. The advantage however is very conſiderable this way: for the filaments grow near as broad as the petals, and with this change of ſhape, they put off their proper colour. The irregularity they give to the general flower is not regarded; partly becauſe the whole is ſo ſmall as to eſcape ſtrict obſervation; and partly for that the ſegments of the flower itſelf are irregular, the loweſt being narrower than the others.

So much as we have now mentioned, culture ſometimes does without being directed immediately to that end. There can be, ſo far as we yet know, but one degree of doubleneſs beyond what we thus find by accident; and perhaps it is not impoſſible to obtain that by art. The extreme ſtate of doubleneſs in flowers, which owe the increaſe to the filaments, is that each of them having been expanded, ſhould divide or ſplit itſelf into two. If this can be brought about in the Veronica, each flower will be rendered juſt double what it was before; for the new petals produced from the filaments will equal the four original ones: the ſpike will thus under the ſame ſurface contain twice the quantity of flowery matter, and all will be uniform in colour.

This is to be attempted the ſame way as in the Tulip; for there is little difference between the conſtituent parts of that plant and this, except in their dimenſions. Theſe ſmall filaments are compoſed of the ſame matter, and conſtructed in the ſame manner with thoſe larger; and they ariſe from the ſame original part of the plant.

In the Veronica, carefully diſſected, we find the ſeveral coats of the plant continued from the root to the flower, as regularly and as perfectly as in the preceding inſtance. The outer bark of the ſtalk conſtitutes the cup, and terminates in it juſt as the outer bark of the Tulip does in the three exterior petals of that flower: The ſecond rind forms the flower, and all its parts terminate ſolely there. The ſingle courſe of veſſels terminates in an irregular ring, juſt within the tubular baſe

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of the flower; the fleſhy ſubſtance runs up into the two filaments; and the pith ends in the rudiment of the ſeed veſſel.

I HAVE traced ſeveral years the progreſs of nature towards doubleneſs in this flower, and have found it paſs through all the ſtages of the larger kinds. Generally the increaſe has proceeded gradually, and regularly in plants, from the ſame root: but ſometimes it has been interrupted, and the flowers have for two or three ſeaſons kept only the ſame degree of doubleneſs; from which they have afterwards advanced farther, or elſe declined to their original weedy and pyebald ſtate. Gardeners have obſerved that ſome years their Veronicas were finer, and ſome years worſe; but they have not gueſſed the manner of the change; much leſs the cauſe.

THE irregularities in this progreſs of the plant towards perfection in doubleneſs, tho' very ſingular, I think may be eaſily explained according to the rules of culture; and if this can be perfectly done, the method of doubling flowers by art, will be then fully known. Of this I am certain

from

from experience, that a neglected double plant will in three or four years, by degrees, become ſingle. This ſhews the luxuriance of the parts is owing to nouriſhment; and we ſhall from experiments find certainly what part, or what article of culture it is which increaſes the fleſhy ſubſtance of the ſtalk, whereon this change depends; and therefore by that be able to produce it: not caſually or imperfectly as it happens now, but regularly, fully, and compleatly.

The progreſs of doubleneſs in the *Veronica* flower proceeds thus in its three ſtages or gradations; for the fourth or perfect ſtate, tho' I doubt not but the plant is capable of it, we have not yet ſeen. In the ſtate of nature the filament is whitiſh, long, narrow at the baſe, and ſomewhat broader at the top, and it is crowned with an oblong anthera. In the firſt ſtage of the change, or rather in the approach towards the change, the filament becomes broader and more blue throughout. The anthera continues white, but is ſmaller than before, and the quantity of farina is much leſs.

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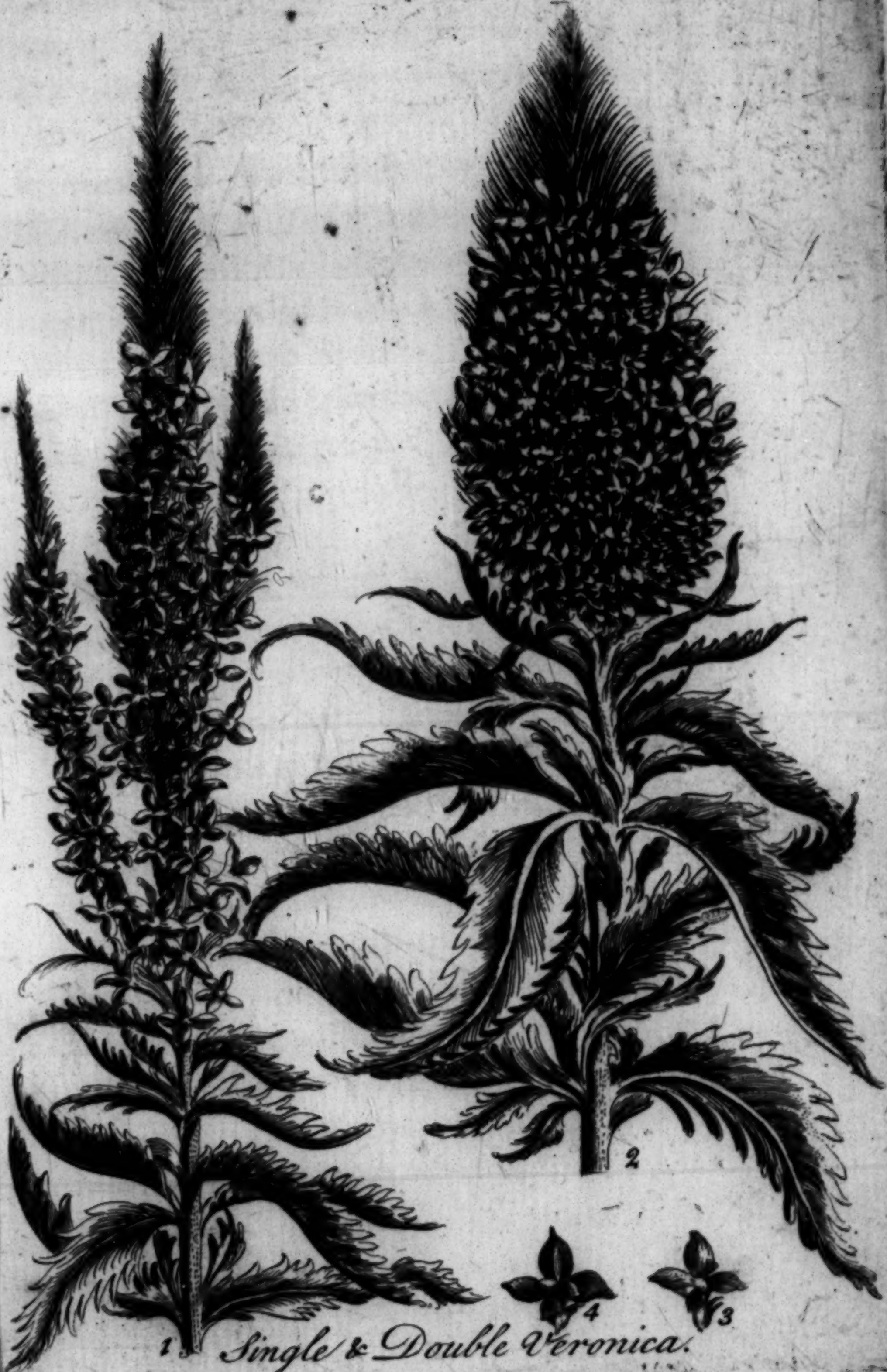

Single & Double Veronica.

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In the ſecond ſtage the filament becomes conſiderably broader, and more approaches to the colour of the reſt of the flower: the anthera is become ſmall, and runs along the edge of the broad top of the filament like a thin white line. In the firſt ſtage it contains ſome farina; and in due time it burſts: in this it has none, nor does it ever open.

In the third ſtage the filament is yet broader: it approaches to the form and nature of the ſegments of the flower, and the anthera is quite obliterated and loſt. This is the utmoſt ſtate of doubleneſs yet known in the Veronica; and this is a great addition to its beauty. The reſt is to be attempted: and we have beſide the grounds of the proceſs thus diſcovered in the ſtructure of the plant, the abſolute proof of contraries, at leaſt in favour of the expectation. Experience ſhews that a neglect of culture will reduce double flowers to their original ſingle ſtate; and there is no reaſon to doubt but good management will as regularly make the ſingle double. *See Pl.* 7. where 1. is the ſingle, 2. the double plant; 3. the ſingle flower ſeparate, and 4. the double one.

CHAP. IV.

Of the Degradation of double FLOWERS.

NO one is ignorant that double flowers have been produced originally from the roots or ſeeds of ſingle ones; by accidents favouring the peculiar growth of that part of the plant whereon the doubleneſs of the flower depends. This is plain from the courſe of nature in her productions. For the anthera being obliterated in the third and fourth degree of doubleneſs ariſing from the filaments, there can be no ſeeds ripened in the ſeed veſſels of ſuch flowers. We have ſeen elſewhere, by undeniable proofs, that the rudiment of the future plant is contained in the globule of farina; and that the ſeed is only a ſhell or caſe for its reception, preſervation, and defence. Therefore when there is no anthera, no ſeed can ripen: and conſequently perfect double flowers cannot be raiſed from the ſeeds of plants, with the ſame kind of flowers.

THIS ſhews that in botanical ſtrictneſs, it is right to call the plants with double flowers

flowers VARIETIES of the ſingle, not diſtinct ſpecies from them; but they have ſtretched the point too far, who call them MONSTERS.

As a peculiar degree and kind of nouriſhment given to the roots in a particular manner, has ſwelled and expanded the fleſhy ſubſtance of the ſtalk, and made it in theſe inſtances luxuriant in the filaments, the conſequence of neglect will be a degradation of the flower, as regular as was the riſe to this kind of excellence.

WHEN a Tulip has from favouring circumſtances in the courſe of four, or with interruptions in five, ſix, or more years, been paſſing the ſeveral ſtages to perfect doubleneſs, the filament firſt expanding ſimply, then dividing, the anthera being obliterated in the third ſtage, and the body of the filament ſplit flatwiſe in the fourth; ſo in the ſame courſe of years, or perhaps fewer, with neglect, it will deſcend to its original ſimplicity again; unleſs the ſame good management which favoured the increaſe of the petals continue, and preſerve it.

If a Tulip which has thus attained the ſtate of perfect doubleneſs, be every year taken up at a certain period and planted in good compoſt afterwards, it will continue always ſuch as it appeared when perfect. The bulb is renewed every year; and there is therefore no decay from age. But on the contrary, if the root be planted when thus perfect in common ground, and ſuffered to remain there, the ſoil being neither changed nor dug, tho' it be ever ſo well cleared of weeds, the conſequence will be that tho' the plant retains all its vigour, the flower will yearly loſe part of its doubleneſs. The firſt year the twelve additional petals will be reduced to ſix, and there will be in theſe a portion of that yellow ſubſtance which formed the body of the original filament: The ſecond year the antheræ will appear upon the tops of the ſix additional petals; and thoſe will be narrower and thicker, and leſs colour'd than before: the third year they will differ little from common filaments; and the fourth ſeaſon will afford from the ſame root a common ſingle Tulip.

In the Veronica it is the ſame. Let a plant of it in the beſt ſtate of doubleneſs we know, be left in an undug border; the ſecond year ſhall ſhew the form of an imperfect anthera upon a pale and ſomewhat narrow inner petal. The third ſeaſon the anthera will ſhew its proper form, and the filament will become narrow and be but little coloured; and the fourth ſummer ſhall produce a common ſingle flower.

WHAT this neglect reduces to its original ſtate, culture has plainly raiſed from that ſtate into the other. That culture can do ſomething towards the producing this change in the Veronica, muſt not be doubted, for this ſeaſon the plant has riſen to the third ſtage of doubleneſs with Mr. *Lee* of *Hammerſmith*, to whom I recommended the care of it when named in *Eden:* and there is a beauty in the flower greatly ſuperior to what has before been ſeen. The ſpike is ſhorter, but the flowers appear in a perfection altogether unknown before: they ſeem as if they were twice as thick ſet as uſual, for each flower having a larger number of petals, appears nearly as big as two. The new petals naturally curl a little inwards; and this has an an advantage: for the inner part of the flower is whitiſh, and would naturally give ſome of that motly aſpect we diſlike to the whole, but theſe new petals hide it by their curling, and the whole is a celeſtial blue.

THE attempt to effect theſe changes by a regular culture muſt be thus: the roots muſt be new planted every autumn, and MARLE added to the mould. We find this increaſes that part of the timber of trees, which forms the filaments in flowers. Every plant muſt have a yard ſquare of ground, whereon nothing elſe grows; and the ſtalks muſt be annually cut down as ſoon as they begin to flower; watering the root daily for a month after. This fills the bud for the ſucceeding year with the fit nouriſhment.

THE END.

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DIRECTIONS to the BINDER.

Plate *o* to face page 9.—Pl. 1. p. 10.—Pl. 2. p. 22.—Pl. 3. p. 24.—Pl. 4. p. 26.—Pl. 5. p. 28.—Pl. 6. ibid.—Pl. 7. p. 34.

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